

Electronic Supplementary Materials

Flexible information-seeking in chimpanzees

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Supplemental Results: Study 1

Long Look Trials

As reported in the main text, our first set of analyses for study 1 examined predictors of spontaneous information seeking in the *long look* trials, finding that younger and female chimpanzees engaged in more information seeking. Table S1 reports the parameter estimates for the best fit model from those analyses.

| Predictor                     | Estimate | S.E.  | t value | p value        |
|-------------------------------|----------|-------|---------|----------------|
| Trial Number (for trial type) | -0.413   | 0.256 | -1.613  | = 0.11         |
| Age (in years)                | -0.313   | 0.182 | -1.724  | = 0.084        |
| Sex (reference = Females)     | 12.867   | 7.573 | 1.699   | = 0.089        |
| Age X Sex                     | -0.916   | 0.432 | -2.118  | = <b>0.034</b> |

**Table S1: Predictors of spontaneous looking in Study 1.** Parameters are from the best-fit model (model 4: full model); reference level is noted in the table as relevant.

As reported in the main text, our second set of analyses for study 1 examined predictors of latency of information seeking in the *long look* trials, finding that when individuals did look, there were not major individual variation in their latency to do so. Table S2 reports the parameter estimates for the full model from those analyses. We also analyzed these latency data removing the subset of trials with 0s latencies (e.g., the chimpanzee looked before the experimenter completed the baiting demonstration), which here consisted of only 4 trials; this did not affect the pattern of results.

| Predictor                     | Estimate | S.E.   | t value | p value |
|-------------------------------|----------|--------|---------|---------|
| Trial Number (for trial type) | -3.127   | 3.077  | -1.016  | = 0.31  |
| Age (in years)                | 1.164    | 1.518  | 0.767   | = 0.45  |
| Sex (reference = Females)     | -32.040  | 51.275 | -0.625  | = 0.54  |
| Age X Sex                     | 2.256    | 3.059  | 0.737   | = 0.47  |

**Table S2: Predictors of spontaneous looking latency in Study 1.** Parameters are from the full model (model 4); note that this was the best model by AIC values but not by likelihood ratio tests. Reference level is noted in the table as relevant.

Short Look Trials

In the main text we reported that there were no major differences in propensity to produce a look in the short look trials; these trials were only performed with the subject of chimpanzees who had met our criterion for producing looks in the initial spontaneous trials.

We also examined the latency to produce the looks. Overall, chimpanzees had a latency of  $5.00 \pm 0.73$ s to produce a look in these trials. The base model indicted no significant change in latencies over trials. There was a trend for slower latencies with *age* [ $\chi^2 = 3.07$ ,  $df = 1$ ,  $p = 0.08$ , n.s.], but no improvement with the inclusion of *sex* [ $\chi^2 = 0.09$ ,  $df = 1$ ,  $p > 0.75$ , n.s.], or the interaction between *age* and *sex* [ $\chi^2 = 0.167$ ,  $df = 2$ ,  $p > 0.91$ , n.s.]. We found the same basic

results when removing the subset of 49 trials (28% of the total) where the chimpanzees had a 0s looking latency (e.g., looked before the demonstration was complete).

*Looking Responses Across the Session*

As reported in the main text, our final set of analyses for study 1 examined predictors of information seeking across all trials in the session, specifically comparing initial introductory trials (collapsing across *warmup*, *pretest*, and *show food versus no food* trials) compared to the subsequent *long look* and *short look* test trials. To do so, we limited this analysis to looks that occurred within 10s of the trial start, to equate time across trial types. We found that chimpanzees were much more likely to look in the test trial phases than the initial introductory trials (where such looks were not necessary to make a choice). Table S3 reports the parameter estimates for the full model from those analyses.

| <b>Predictor</b>                           | <b>Estimate</b> | <b>S.E.</b> | <b>z value</b> | <b>p value</b>  |
|--|-----------------|-------------|----------------|-----------------|
| Trial Number (for trial type)              | -0.040          | 0.041       | -0.959         | = 0.34          |
| Age (in years)                             | -0.141          | 0.050       | -2.823         | = <b>0.005</b>  |
| Sex (reference = Females)                  | -0.642          | 0.454       | -1.415         | = 0.16          |
| Trial Type: Introductory (ref = Long Look) | -2.376          | 0.295       | -8.049         | < <b>0.0001</b> |
| Trial Type: Short Look (ref = Long Look)   | 1.128           | 0.269       | 4.1876         | < <b>0.0001</b> |

**Table S3: Predictors of looking across the session in Study 1.** Parameters are from the best-fit model (model 2: full model); reference level is noted in the table as relevant.

**Supplemental Results: Study 2**

As reported in the main text, our first set of analyses for study 2 examined predictors of information seeking across conditions, and found that chimpanzees engaged in information seeking when the baiting was hidden, at similar rates for both location and identity information. Table S4 reports parameter estimates from those analyses.

| <b>Predictor</b>                         | <b>Estimate</b> | <b>S.E.</b> | <b>t value</b> | <b>p value</b>  |
|--|-----------------|-------------|----------------|-----------------|
| Trial Number (for trial type)            | -0.039          | 0.022       | -1.735         | = 0.082         |
| Age (in years)                           | 0.001           | 0.071       | 0.011          | = 0.99          |
| Sex (reference = Females)                | 1.523           | 0.637       | 2.391          | = <b>0.017</b>  |
| Outcome Visibility (reference = Visible) | 2.257           | 0.332       | 6.801          | < <b>0.0001</b> |
| Information Type (reference = Location)  | 0.462           | 0.303       | 1.527          | = 0.13          |

**Table S4: Predictors of looking in Study 2.** Parameters are from the model including both outcome visibility and information type (location versus identity); inclusion of information type did not improve fit.

As reported in the main text, we also examined predictors of latency to engage in information seeking across conditions, and found that chimpanzees were also faster to look in the hidden baiting condition. Table S5 reports parameter estimates from those analyses. When removing all 0s latencies where the chimpanzees initiated their looking response while the baiting process was still ongoing, there were no differences between conditions. However, in this study there were many such looks initiated before the baiting process was complete (39%; 44 out of 112; 37 of these occurred in the hidden condition specifically), so this may be a sample size issue.

| Predictor                                | Estimate | S.E.  | <i>t</i> value | <i>p</i> value |
|--|----------|-------|----------------|----------------|
| Trial Number (for trial type)            | -0.113   | 0.046 | -2.460         | = <b>0.015</b> |
| Age (in years)                           | 0.045    | 0.131 | 0.343          | = 0.74         |
| Sex (reference = Females)                | -0.408   | 1.190 | -0.342         | = 0.74         |
| Outcome Visibility (reference = Visible) | -1.432   | 0.709 | -2.019         | = <b>0.046</b> |

**Table S5: Predictors of latency to look in Study 2.** Parameters are from the model including outcome visibility; inclusion of information type did not further improve fit in these models.

### Supplemental Results: Study 3

As reported in the main text, our first set of analyses for study 3 examined predictors of information seeking across the hidden versus visible baiting *risky choice* trials, and found that chimpanzees produced looks at similar rates across conditions. Table S6 reports parameter estimates from those analyses.

| Predictor                             | Estimate | S.E.  | <i>t</i> value | <i>p</i> value |
|---------------------------------------|----------|-------|----------------|----------------|
| Trial Number (for trial type)         | -0.067   | 0.058 | -1.163         | = 0.24         |
| Age (in years)                        | -0.464   | 0.182 | -2.545         | = <b>0.011</b> |
| Sex (reference = Females)             | 0.785    | 1.411 | 0.556          | = 0.58         |
| Risk Visibility (reference = Visible) | 0.703    | 0.538 | 1.308          | = 0.19         |

**Table S6: Predictors of looking responses on risky choice trials in Study 3.** Parameters are from the model including risk visibility; inclusion of this factor did not improve fit.

As reported in the main text, we also examined predictors of latency to look across the *risky choice* trials, and found that chimpanzees were faster to produce looks in the hidden baiting trials. Table S7 reports parameter estimates from those analyses. We also checked the analyses removing the 7 trials in this study with 0s latencies, and found the same results.

| Predictor                             | Estimate | S.E.  | <i>t</i> value | <i>p</i> value |
|---------------------------------------|----------|-------|----------------|----------------|
| Trial Number (for trial type)         | -0.051   | 0.107 | -0.477         | = 0.63         |
| Age (in years)                        | 0.917    | 0.531 | 1.728          | = 0.26         |
| Sex (reference = Females)             | 1.018    | 3.801 | 0.268          | = 0.82         |
| Risk Visibility (reference = Visible) | -2.921   | 0.976 | -2.991         | = <b>0.004</b> |

**Table S7: Predictors of latency to look on risky choice trials in Study 3.** Parameters are from the model including risk visibility; inclusion of this factor did improve fit.

Finally, as reported in the main text, we examined predictors of looking responses in the *risk visibility exposure* trials, which directly preceded the *risky choice* trials. These were identical to the risky choice trials except that only the risky option was available to choose. Here, we found that chimpanzees looked more often on hidden baiting trials. Table S8 reports parameter estimates from those analyses.

| <b>Predictor</b>                      | <b>Estimate</b> | <b>S.E.</b> | <b><i>t</i> value</b> | <b><i>p</i> value</b> |
|---------------------------------------|-----------------|-------------|-----------------------|-----------------------|
| Trial Number (for trial type)         | -0.192          | 0.176       | -1.09                 | = 0.28                |
| Age (in years)                        | -0.697          | 0.198       | -3.521                | = <b>0.0004</b>       |
| Sex (reference = Females)             | -0.917          | 1.011       | -0.908                | = 0.36                |
| Risk Visibility (reference = Visible) | 1.894           | 0.905       | 2.093                 | = <b>0.036</b>        |

**Table S8: Predictors of looking responses on risk visibility exposure trials in Study 3.** Parameters are from the model including risk visibility; inclusion of this factor did improve fit.

### Supplemental Video Captions

*Video S1: Study 1 – Long and Short Look Trials.* The first clip shows a *long look* trial. Here, the chimpanzee first witnesses that the experimenter baited one of two possible containers with five peanuts, but does not know which was baited as their view was blocked by an occluder. During baiting, the bowls were moved to the center of the table to further obscure the baited location, and then moved to sides for the chimpanzee's responses. The chimpanzee had no prior experience with this setup, but could make an inference to stand up and look into the containers to view which one was baited. Here, the experimenter did not push the table forward for their choice (by pulling the string attached to one container) until the chimpanzee stands or climbs up; if the chimpanzee does not do so within 3 minutes, the experimenter held up the bowls to prompt this response. The second clip shows an example *short look* trial. These were similar to the longer trials, but the experimenter always pushed the table forward after 10s regardless of whether the chimpanzee looked. The baited side (left or right) was counterbalanced and quasi-randomized across the trials.

*Video S2: Study 2 – Hidden and visible baiting in location and identity test trials.* The first clip shows an example *location information—hidden baiting* trial. These trials were similar to the *short look* trials from Study 1, except that the experimenter baited the location with a highly preferred food (banana) behind the barrier. The second clip shows an example *location information—visible baiting* trial. Here, the experimenter performs the same actions as in the hidden baiting procedure, except there is no occluder was present so the chimpanzee could directly see which container was baited in advance. The third clip shows an example *identity information—hidden baiting* trial. In these trials, the experimenter first showed the chimpanzee two pieces of food in a separate outcome bowl (one highly preferred banana slice, and one unpreferred cucumber slice). She then tipped the bowl's orientation away from the chimpanzee, reached into the bowl to take one item, and placed it in the left bowl with a closed fist. She repeated the same action to bait the right bowl. Since the bowl's orientation was away from the chimpanzee, and the experimenter used a closed fist to bait the bowls, the chimpanzee could not see which food was placed where without standing up. The final clip shows an example *identity information—visible baiting* trial. Here, the experimenter performs the same actions as in the hidden baiting procedure, except that she used an open hand to place the food, such that the chimpanzee could see the food type. Across trials, the baited side (or side baited with the preferred food) was counterbalanced and quasi-randomized across the trials. In the identity trials, the experimenter always baited the left and then the right side.

*Video S3: Study 3 – Hidden and visible baiting in risky choice trials.* The first clip shows an example *risky choice—hidden baiting* trial. Here, the experimenter first visibly baited the left container with the safe option (a peanut), and then baited the right container with the risk outcome. Using the same general procedure as in the *identity* trials from Study 2, she showed the chimpanzee a risk outcome bowl with two items (the preferred and non-preferred food types), and then reached in with an closed fist to bait the risky option. As such, the chimpanzee did not know which risk outcome was provided unless they stood up to look into the container. The second clip shows an example *risky choice—visible baiting* trial. Here, the experimenter performs the same actions as in the hidden baiting procedure, except that she used an open hand to place the risk option such that the chimpanzee could see the food type it provided in advance. Across trials, the side assignment of the risky option and the outcome of the risky option (preferred or non-preferred food) was counterbalanced and quasi-randomized across the trials; the experimenter always baited the left and then the right side.